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Building & Highway Material Testing Laboratory

NABL - Accredited Laboratory as per ISO / IEC-17025 :2005

T-2377

Job No.: CTCE/BBMP/W.No.12/KRIDL/CSR-03/1095d/QB(BC)/2015-16 14.03.2016

TEST REPORT ON DETERMINATION OF BITUMEN CHARACTERISTICS

*CUSTOMER	:	**Asst. Executive Engineer,** Shettyhalli Sub Division, BBMP, Bangalore.
*AGENCY	:	**Technical Manager (West),** KRIDL, Bangalore.
*NAME OF THE WORK	:	Asphalting to cross and main roads at Mallasandra Near Attilakkamma temple area in Ward No.12 of Shettyhalli Sub Division, BBMP, Bangalore.
REFERENCE	:	AEE/SSD/PR/ /2015-16
*SAMPLE ID	:	Bitumen
DATE OF SAMPLING	:	01.04.2016
DATE OF TESTING	:	02.04.2016

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The results of the tests conducted on the bitumen sample.

Sl. No	Description	Test Method as per IS	Test Result	Requirement as per IS:73:2013
1	Penetration at 25 ^{0}C, 1/10 mm	IS :1203 -1978 (RA-2009)	84	80 to 100
2	Softening point, ^{0}C	IS :1205 -1978 (RA-2009)	43	Min. 40
3	Ductility at 27^{0}C, cm	IS :1208 -1978 (RA-2009)	100 >	Min. 75
4	Flash Point, ^{0}C	IS :1209 -1978 (RA-2009)	292	Min. 220

*Information is furnished by the Customer/Representative.

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Note:

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AE-12

14/3

ಸಹಾಯಕ ಕಾರ್ಯಪಾಲಕ ಅಭಿಯಂತರರು
ಶೆಟ್ಟಿಹಳ್ಳಿ ಉಪವಿಭಾಗ, ದಾಸರಹಳ್ಳಿ ವಲಯ
ಬೃಹತ್ ಬೆಂಗಳೂರು ಮಹಾನಗರ ಪಾಲಿಕೆ
ಎಸ್.ಎಂ. ರಸ್ತೆ, ರವೀಂದ್ರನಗರ, ಬೆಂಗಳೂರು

****

VISHWANATH .C
Quality Manager

#23/14, 7th Cross, 3rd Stage, 4th Block, Shakthi Ganapathi Nagara, Basaveshwaranagar, Bangalore-79.
Tele Fax : 23223227, Website : www.civiltechconsultants.com
E-mail : vishwanath.ia@civiltechconsultants.com / info@civiltechconsultants.com

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Job No.: CTCE/BBMP/W.No.12/KRIDL/BC/AIV/2015-16 15.03.2016

Aggregate Impact Value

IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Shettyhalli Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, Bangalore.
Name of the Work	Asphalting to cross and main roads at Mallasandra Near Attilakkamma temple area in Ward No.12 of Shettyhalli Sub Division, BBMP, Bangalore.
Reference	AEE/SSD/PR/ /2015-16
Source / Location	Hot Mix Plant, Bangalore
Type of Mix	Bituminous Concrete
Date of Testing	15.03.2016

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Sl No.	Details	Trial No.		Average
		1	2	
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	389	390	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	88	85	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	301	305	
4	Aggregate Impact value = percent fines 100* (W_2/W_1) percent	22.62	21.79	22.21

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Comments:

→ Maximum allowable Aggregate Impact value for Bituminous Concrete is 24%

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ಪಾಯಕ ಕಾರ್ಯನಿರ್ವಾಹಕ ಅಭಿಯಂತರರು
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ಎಸ್.ಎಂ ಕನ್ಸ್, ಶಿವೇಂದ್ರನಗರ, ಬೆಂಗಳೂರು

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Job No.: CTCE/BBMP/W.No.12/KRIDL/BC/AIV/2015-16 15.03.2016

Aggregate Impact Value

IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Shettyhalli Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, Bangalore.
Name of the Work	Asphalting to cross and main roads at Mallasandra Near Attilakkamma temple area in Ward No.12 of Shettyhalli Sub Division, BBMP, Bangalore.
Reference	AEE/SSD/PR/ /2015-16
Source / Location	Hot Mix Plant, Bangalore
Type of Mix	Bituminous Concrete
Date of Testing	15.03.2016

Sl No.	Details	Trial No.		Average
		1	2	
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	392	394	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	92	94	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	300	300	
4	Aggregate Impact value = percent fines 100* (W_2/W_1) percent	23.47	23.86	**23.66**

Comments:

→ Maximum allowable Aggregate Impact value for Bituminous Concrete is 24%

Note:

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Job No.: CTCE/BBMP/W.No.12/KRIDL/BC/AIV/2015-16 15.03.2016

Aggregate Impact Value

IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Shettyhalli Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, Bangalore.
Name of the Work	Asphalting to cross and main roads at Mallasandra Near Attilakkamma temple area in Ward No.12 of Shettyhalli Sub Division, BBMP, Bangalore.
Reference	AEE/SSD/PR/ /2015-16
Source / Location	Hot Mix Plant, Bangalore
Type of Mix	Bituminous Concrete
Date of Testing	15.03.2016

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Sl No.	Details	Trial No.		Average
		1	2	
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	387	388	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	85	86	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	302	302	
4	Aggregate Impact value = percent fines 100* (W_2/W_1) percent	21.96	22.16	**22.06**

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Comments:

→ Maximum allowable Aggregate Impact value for Bituminous Concrete is 24%

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Job No.: CTCE/BBMP/W.No.12/KRIDL/BC/AIV/2015-16 15.03.2016

Aggregate Impact Value

IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Shettyhalli Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, Bangalore.
Name of the Work	Asphalting to cross and main roads at Mallasandra Near Attilakkamma temple area in Ward No.12 of Shettyhalli Sub Division, BBMP, Bangalore.
Reference	AEE/SSD/PR/ /2015-16
Source / Location	Hot Mix Plant, Bangalore
Type of Mix	Bituminous Concrete
Date of Testing	15.03.2016

Sl No.	Details	Trial No.		Average
		1	2	
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	390	393	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	89	90	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	301	303	
4	Aggregate Impact value = percent fines 100* (W_2/W_1) percent	22.82	22.90	22.86

Comments:

→ Maximum allowable Aggregate Impact value for Bituminous Concrete is 24%

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Job No.: CTCE/BBMP/W.No.12/KRIDL/BC/Shape.T/2015-16 : 15.03.2016

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Customer	: **Asst. Executive Engineer,** Shettyhalli Sub Division, BBMP, Bangalore.
Agency	: **Technical Manager (West),** KRIDL, Bangalore.
Name of Work	: Asphalting to cross and main roads at Mallasandra Near Attilakkamma temple area in Ward No.12 of Shettyhalli Sub Division, BBMP, Bangalore.
Reference	: AEE/SSD/PR/ /2015-16
Technical Reference	: IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	: Bituminous Concrete
Date of Testing	: 15.03.2016

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Result : Flakiness Index = **11.55%**

Elongation Index = **13.10%**

Result : Combined Flakiness & Elongation index **24.65%**

Comments:

→ Maximum allowable Flakiness & Elongation Index for Bituminous Concrete is 30%

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DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

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Reference	: AEE/SSD/PR/ /2015-16
Technical Reference	: IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	: Bituminous Concrete
Date of Testing	: 15.03.2016

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Result : Flakiness Index = **12.40%**

Elongation Index = **13.63%**

Result : Combined Flakiness & Elongation index **26.03%**

Comments:

→ Maximum allowable Flakiness & Elongation Index for Bituminous Concrete is 30%

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AC-12

ಕಾಯಕ ಕಾರ್ಯಪಾಲಕ ಅಭಿಯಂತರರು
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DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Customer	: **Asst. Executive Engineer,** Shettyhalli Sub Division, BBMP, Bangalore.
Agency	: **Technical Manager (West),** KRIDL, Bangalore.
Name of Work	: Asphalting to cross and main roads at Mallasandra Near Attilakkamma temple area in Ward No.12 of Shettyhalli Sub Division, BBMP, Bangalore.
Reference	: AEE/SSD/PR/ /2015-16
Technical Reference	: IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	: Bituminous Concrete
Date of Testing	: 15.03.2016

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Result : Flakiness Index = **12.38%**

Elongation Index = **13.90%**

Result : Combined Flakiness & Elongation index **26.28%**

Comments:

→ Maximum allowable Flakiness & Elongation Index for Bituminous Concrete is 30%

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Job No: CTCE/BBMP/W.No.12/KRIDL/BC/Shape.T/2015-16 : 15.03.2016

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Reference	: AEE/SSD/PR/ /2015-16
Technical Reference	: IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	: Bituminous Concrete
Date of Testing	: 15.03.2016

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Result : Flakiness Index = **11.97%**

Elongation Index = **13.04%**

Result : Combined Flakiness & Elongation index **25.01%**

Comments:

→ Maximum allowable Flakiness & Elongation Index for Bituminous Concrete is 30%

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Job No.: CTCE/BBMP/W.No.12/KRIDL/BC/Stripping/2015-16 18.03.2016

Stripping Value of Road Aggregates (Static Immersion Test)

IS: 6241

Customer	**Asst. Executive Engineer,** Shettyhalli Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, Bangalore.
Name of the Work	Asphalting to cross and main roads at Mallasandra Near Attilakkamma temple area in Ward No.12 of Shettyhalli Sub Division, BBMP, Bangalore.
Reference	AEE/SSD/PR/ /2015-16
Type of Mix	Bituminous Concrete
Date of Testing	18.03.2016

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Type of binder : 80/100
Percentage of binder used : 5.00% by wt.
Total weight of aggregate : 200 g
Total weight of binder : 10.00 g
Temperature of water-bath : 40° C

Observation Number	Stripping, Percentage	Average, Percentage	Average Retained Coating, %
1	3.3	3.30	96.70
2	3.2		
3	3.4		

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Comments:

→ Minimum allowable Aggregate retained coating for Bituminous Concrete is 95%

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18/3

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Specific Gravity And Water Absorption Test

IS: 2386 Part III

Customer	**Asst. Executive Engineer,** Shettyhalli Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, Bangalore.
Name of the Work	Asphalting to cross and main roads at Mallasandra Near Attilakkamma temple area in Ward No.12 of Shettyhalli Sub Division, BBMP, Bangalore.
Reference	AEE/SSD/PR/ /2015-16
Type of Mix	Bituminous Concrete
Date of Testing	18.03.2016

Sl. No.	Details	Notation	Test Number			Mean Value
			Test 1	Test 2	Test 3	
1	Weight of aggregate suspended in water with the basket	W_1 g	1996	1998	1999	
2	Weight of basket suspended in water	W_2 g	755	755	755	
3	Weight of saturated aggregate in water	$(W_1 - W_2) = W_s$ g	1239	1238	1244	
4	Weight of saturated surface dry aggregate in air	W_3 g	2020	2021	2022	
5	Weight of water equal to the volume of the aggregate	$(W_3 - W_S)$ g	781	783	778	
6	Weight of oven dried aggregate	W_4 g	2003	2005	2006	
7	Specific Gravity	$W_4/(W_3-W_S)$	2.565	2.561	2.578	2.568
8	Apparent Specific gravity	$W_4/(W_4-W_S)$	2.622	2.614	2.633	2.623
9	Water Absorption	$((W_3-W_4)*100)/W_4$	0.85%	0.80%	0.80%	0.81%

Comments:

→ Maximum allowable Aggregate Water absorption value for Bituminous Concrete is 2.0%

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Job No: CTCE/BBMP/W.No.12/KRIDL/BC/Bitumen/2015-16 18.03.2016

BITUMEN CONTENT DETERMINATION OF BITUMINOUS CONCRETE MIX

As per IRC:SP:11-1984

CUSTOMER	**Asst. Executive Engineer,** Shettyhalli Sub Division, BBMP, Bangalore.
AGENCY	**Technical Manager (West),** KRIDL, Bangalore.
NAME OF THE WORK	Asphalting to cross and main roads at Mallasandra Near Attilakkamma temple area in Ward No.12 of Shettyhalli Sub Division, BBMP, Bangalore.
REFERENCE	AEE/SSD/PR/ /2015-16
SAMPLE I/D	Roads at Mallasandra, ward No.12, BBMP, Bangalore.
DATE OF TESTING	18.03.2016

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BITUMEN CONTENT DETERMINATION

Description	Trail 1	Trail 2
1. Weight of Mixture before Test, g	500	500
2. Weight of Mixture after Test, g	474.5	472
3. Weight of Asphalt and Mineral matter Extracted, g	-	
4. Weight of Mineral Matter, g.	-	-
5. Weight of Ash, g		
6. Weight of Bitumen Extracted, g. (corrected)	25.5	28.00
7. Bitumen content in %	5.10	5.60
8. Average	**5.35**	

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BITUMEN CONTENT AFTER GRADATION DETERMINATION OF BITUMINOUS CONCRETE MIX

As Per IS 2386 and IRC:SP:11-1984

CUSTOMER	**Asst. Executive Engineer,** Shettyhalli Sub Division, BBMP, Bangalore.
AGENCY	**Technical Manager (West),** KRIDL, Bangalore.
NAME OF THE WORK	Asphalting to cross and main roads at Mallasandra Near Attilakkamma temple area in Ward No.12 of Shettyhalli Sub Division, BBMP, Bangalore.
REFERENCE	AEE/SSD/PR/ /2015-16
SAMPLE I/D	Roads at Mallasandra, ward No.12, BBMP, Bangalore.
DATE OF TESTING	18.03.2016

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GRADATION AFTER EXTRACTION

Sieve Size in mm	Trail 1				Specified Limits as per MORTH specification table 500-18 (Grading-2)
	Weight Retained, gm	% Retained	%Cummulative Retained	% Passing	
19	0	0	0	100	100
13.2	45.32	9.55	9.55	90.45	79-100
9.5	37.25	7.85	17.40	82.60	70-88
4.75	68.59	14.46	31.86	68.14	53-71
2.36	67.23	14.17	46.03	53.97	42-58
1.18	56.32	11.87	57.89	42.11	34-48
0.6	63.32	13.34	71.24	28.76	26-38
0.3	39.22	8.27	79.50	20.50	18-28
0.15	30.22	6.37	85.87	14.13	12-20
0.075	32.65	6.88	92.75	7.25	4-10

Sieve Size in mm	Trail 2				Specified Limits as per MORTH specification table 500-18 (Grading-2)
	Weight Retained, gm	% Retained	%Cummulative Retained	% Passing	
19	0	0	0	100	100
13.2	40.22	8.52	8.52	91.48	79-100
9.5	41.36	8.76	17.28	82.72	70-88
4.75	75.25	15.94	33.23	66.77	53-71
2.36	65.32	13.84	47.07	52.93	42-58
1.18	70.32	14.90	61.96	38.04	34-48
0.6	44.69	9.47	71.43	28.57	26-38
0.3	41.22	8.73	80.17	19.83	18-28
0.15	28.56	6.05	86.22	13.78	12-20
0.075	34.26	7.26	93.47	6.53	4-10

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Job No.: CTCE/BBMP/W.No.12/KRIDL/BC/Agg/2015-16 18.03.2016

Aggregate Gradation Test

IS : 2386 Part I

Customer	**Asst. Executive Engineer,** Shettyhalli Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, Bangalore.
Name of theWork	Asphalting to cross and main roads at Mallasandra Near Attilakkamma temple area in Ward No.12 of Shettyhalli Sub Division, BBMP, Bangalore.
Reference	AEE/SSD/PR/ /2015-16
Sample I / D	Hot Mix Plant, Bangalore
Type of Mix	Bituminous Concrete
Date of Testing	18.03.2016

Total Weight of Sample: **5200** gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	JOBMIX Gradation as per MORTH	Remarks
19	0	0	0	100	100	Gradation satisfies Bituminous concrete Grade-II specification as per MORTH
13.2	615	11.83	11.83	88.17	79 - 100	
9.5	450	8.65	20.48	79.52	70 - 88	
4.75	560	10.77	31.25	68.75	53 - 71	
2.36	615	11.83	43.08	56.92	42 - 58	
1.18	620	11.92	55.00	45.00	34 - 48	
0.600	535	10.29	65.29	34.71	26 - 38	
0.300	580	11.15	76.44	23.56	18 - 28	
0.150	440	8.46	84.90	15.10	12 - 20	
0.075	410	7.88	92.79	7.21	4 - 10	

Total Weight of Sample: **5300** gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	JOBMIX Gradation as per MORTH	Remarks
19	0	0	0	100	100	Gradation satisfies Bituminous concrete Grade-II specification as per MORTH
13.2	625	11.79	11.79	88.21	79 - 100	
9.5	460	8.68	20.47	79.53	70 - 88	
4.75	585	11.04	31.51	68.49	53 - 71	
2.36	620	11.70	43.21	56.79	42 - 58	
1.18	640	12.08	55.28	44.72	34 - 48	
0.600	560	10.57	65.85	34.15	26 - 38	
0.300	600	11.32	77.17	22.83	18 - 28	
0.150	415	7.83	85.00	15.00	12 - 20	
0.075	430	8.11	93.11	6.89	4 - 10	

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Job No.: CTCE/BBMP/W.No.12/KRIDL /BC/Stability/2015-16 18.03.2016

TEST REPORT ON STABILITY OF MIX

Customer	:	**Asst. Executive Engineer,** Shettyhalli Sub Division, BBMP, Bangalore.
Agency	:	**Technical Manager (West),** KRIDL, Bangalore.
Name of Work	:	Asphalting to cross and main roads at Mallasandra Near Attilakkamma temple area in Ward No.12 of Shettyhalli Sub Division, BBMP, Bangalore.
Reference	:	AEE/SSD/PR/ /2015-16
Source of location	:	Hot mix Plant, Bangalore
Type of Mix	:	Bituminous Concrete
Date of Testing	:	18.03.2016

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The results of the tests conducted on the bituminous concrete mix sample are as follows:

Sl. No	Description	Test Result 1	Test Result 2	Requirement as per MORTH (Table 500-19)
1	Marshal Stability, Kn	9.50	9.65	9 Kn (min)
2	Marshal flow, mm	3.30	3.45	2 – 4
3	Percent air voids in Mineral Aggregate	13.40	13.75	13 – 15
4	Voids in Compacted Mix	4.50	4.90	3 – 6
5	Percent Voids filled with Bitumen	72.50	73.30	65 - 75
6	Density, g/cc	2.27	2.26	--

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